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Neutron interferometry in a temperature controlled vacuum environment for the search of dark energy and other precision experiments PARMINDER SAGGU, Dept of Chemistry, UWaterloo, Waterloo, Canada, D. CORY, IQC, Dept of Chemistry, UWaterloo, Perimeter Institute, Waterloo, Canada, D. PUSHIN, J. NSOFINI, D. SARENAC, IQC, Dept of Physics and Astronomy, UWaterloo, Waterloo, Canada, M. HUBER, M. ARIF, NIST, Gaithersburg, MD USA, C. SHAHI, R. HAUN, Physics & Engineering Physics Dept., Tulane U, New Orleans, LA USA, M. SNOW, Dept of Physics and CEEM, Indiana U/Bloomington, K. LI, V. SKAVYSH, Dept of Physics, Indiana U/Purdue U at Indianapolis, B. HEACOCK, A. YOUNG, Dept of Physics, North Carolina State U, Raleigh NC, USA & the Triangle U Nuclear Lab, Durham, NC, USA, INDEX COLLABORA-TION — The neutron interferometer is a sensitive tool to study neutron interactions in materials. Vibrations, acoustic waves, and temperature gradients can introduce phase shifts and reduce the SNR. Low neutron flux and an interest in measuring increasingly smaller phases makes it necessary for experiments to run over long periods of time. Hence, the interferometer needs to have excellent phase stability. It has been shown that by using Quantum Information Algorithms, one can make the interferometer insensitive to vibrations. In this work, we are trying to remove phase instability due to T variations. At the NCNR, the interferometer has been placed inside a vacuum chamber to decouple it from the environment and increase overall temperature stability. An Al vacuum chamber was machined and assembled to test the concept of an interferometer in vacuum and measure phase stability with the ultimate goal of using an interferometer in vacuum in an experiment searching for dark energy.

> Parminder Saggu Department of Chemistry, U of Waterloo, Waterloo, ON, Canada

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